Bond Asset Backed Security Numerical and Empirical Test

Bond asset backed securities (ABSs) are financial securities that are backed by bonds. We assume that interest rates are deterministic. Expectation of prepayments as an input of model could not dynamically capture prepayment risk.

Credit risk is considered in the methodology for valuation covering all bond classes. In addition, it should be realized that the downgrade among global structured finance securities remained elevated these years.

Currently, this model is used to capture IR risk sensitivities of the ABSs with various credit ratings ranging from AAA to D. The sensitivity test shows that the impact of default risks on risk sensitivities is not negligible.

The test was conducted by building a benchmark model covering asset-backed trades. First, we implemented a benchmark model and tested the dirty prices, accrued amounts and market values. Second, to illustrate the model risk uncertainty, we conducted a sensitivity analysis on PV01 with and without default risks.

The test results for Price, Accrual, and Market Value of bond asset backed securities are given by

Table 1: Selected UAT test results for Price, Accrual and Market Value of asset-backed securities

	Dirty Price		Accrual		Market Value	
ID	Model	Benchmark	Model	Benchmark	Model	Benchmark
AB_WCRE06-1A2A	100.109912	100.1099191	3,988.86	4,078.90	3,243,937.62	3,243,984.69
AB_BRNL07-1AA4C	100.602245	100.5995626	4,996.23	4,996.23	5,881,014.16	5,880,857.45
AB_MABLN0-12/30	103.775549	103.7714264	89,865.69	89,865.70	47,181,093.84	47,179,223.30
AB_ACCSS01-2A1	101.491872	101.4869019	2,027.16	2,027.16	7,355,365.57	7,355,005.47
AB_FSTAR06-2A	100.306984	100.2923477	584.38	584.39	3,828,710.44	3,828,151.88
AB_AHM05-2-6A	100.327923	100.3213190	726.77	726.78	4,516,820.82	4,516,523.56
AB_MULB2A-A1A	105.590863	105.5833013	37,790.91	37,790.91	10,083,629.33	10,082,909.92
AB_MULB1A-A1A	106.726285	106.7137571	16,813.34	16,813.34	2,933,578.72	2,933,236.34

The test results for weighted average life (WAL) and PV01 are given below:

Table 2: Selected UAT test results for WAL and PV01 of asset-backed securities

	WAL		PV01	
ID	Model	Benchmark	Model	Benchmark
AB_WCRE06-1A2A	0.49	0.48	-15.18	-13.00
AB_BRNL07-1AA4C	3.03	2.99	-63.17	-63.00

	WAL		PV01	
ID	**Model**	**Benchmark**	**Model**	**Benchmark**
AB_MABLN0-12/30	9.05	8.93	-1,018.17	-1,009.00
AB_ACCSS01-2A1	4.22	4.16	-183.79	-182.00
AB_FSTAR06-2A	3.55	3.50	-17.34	-31.00
AB_AHM05-2-6A	3.14	3.09	-20.66	-29.00
AB_MULB2A-A1A	11.83	11.66	-677.44	-619.00
AB_MULB1A-A1A	14.45	14.25	-332.35	-310.00

We select a portfolio that covers all types of trades. The results are shown below:

Table 3: Comparison of test results for asset-backed securities

Trade ID	Dirty Price			Accrual		
	Model	**Benchmark**	**Diff**	**Model**	**Benchmark**	**Diff**
441021	100.2313666	100.2313665	0.0000001	0.11621319	0.11621319	0.00000000
437400	100.6786872	100.6786872	0.0000000	0.06537297	0.06537298	-0.00000001
437449	103.9671365	103.9671365	0.0000000	0.17240972	0.17240972	0.00000000
437293	101.5098989	101.5098989	0.0000000	0.00267612	0.00267612	0.00000000
444822	100.2373726	100.2373724	0.0000002	0.12767084	0.12767083	0.00000001
437275	100.2775194	100.2775194	0.0000000	0.00061466	0.00061466	0.00000000
437350	100.3137705	100.3137704	0.0000000	0.00426228	0.00426228	0.00000000

Trade ID	Dirty Price			Accrual		
	Model	Benchmark	Diff	Model	Benchmark	Diff
439195	106.0093947	106.0093947	0.0000000	0.37073555	0.37073556	-0.00000001
437392	106.4212836	106.4212836	0.0000000	0.31594290	0.31594290	0.00000000

Table 4: Comparison of test results for asset-backed securities

Trade ID	Market Value			Weighted Average Life		
	Model	Benchmark	Diff (%)	Model	Benchmark	Diff
441021	-3,013,142.53	-3,013,142.52	0.00%	0.520	0.520	0.000
437400	-5,880,482.75	-5,880,482.76	0.00%	3.064	3.064	0.000
437449	-1,163,217.59	-1,163,217.59	0.00%	9.083	9.083	0.000
437293	5,461,369.68	5,461,369.68	0.00%	4.249	4.249	0.000
444822	-5,513,439.57	-5,513,439.56	0.00%	0.520	0.520	0.000
437275	5,071,836.39	5,071,836.35	0.00%	1.931	1.931	0.000
437350	-1,137,697.30	-1,137,697.30	0.00%	3.169	3.169	0.000
439195	-5,288,820.26	-5,288,820.26	0.00%	11.855	11.855	0.000
437392	2,908,429.88	2,908,429.88	0.00%	12.362	12.362	0.000

The following tables show the sensitivity test results. In terms of risk impact, the relative changes of market values of sample deals in response to a 1 bp shift in the underlying curves are less than 0.01%. This is very small.

Table 5: Comparison of risk sensitivity test results for asset-backed securities

Trade ID	PV01			
	Model	Benchmark	Diff	Impact (%)
441021	17.69	17.69	0.00	-0.001%
437400	81.14	81.14	0.00	-0.001%
437449	28.81	28.81	0.00	-0.002%
437293	-153.13	-153.13	0.00	-0.003%
444822	21.66	21.66	0.00	0.000%
437275	-37.72	-37.72	0.00	-0.001%
437350	8.62	8.62	0.00	-0.001%
439195	368.22	368.22	0.00	-0.007%
437392	-173.3	-173.30	0.00	-0.006%

Table 6: Comparison of risk sensitivity test results for ABS deal sample from different perspectives on default risks

Trade ID	PV01		
	No Default Risk	AAA Rating	CCC Rating
437304	-19.47	-17.83	52.10
437272	-73.84	-73.79	-61.56

All the above comparisons confirm that the model is implemented as intended and it is appropriate to apply the model on valuation and IR risk sensitivity capture of ABSs.

References:

https://finpricing.com/lib/CmcFuturesOption.html

https://finpricing.com/lib/CmcSwap.html